TELEDYNE ANALYTICAL INSTRUMENTS

230 Series Thermal Conductivity Gas Analyzers

Monitoring hydrogen and purge gases for greater efficiency and cost reduction.

Thermal Conductivity Gas Analyzers

Thermal conductivity is the basic property of gases that relates to their ability to conduct heat. This property forms the basis of the Teledyne 230 series, which responds to the various differences in thermal conductivities between various gases.

These analyzers are widely used in such diverse industries as air liquefaction, power generation, petrochemical refining, steel manufacture, heat treating, diving and others. Although the 230 Series is used primarily to analyze binary mixtures, it is also well suited for monitoring one component in more complex mixtures when the other gases have the same ratio to each other, or have similar values of thermal conductivity.

Principle of Measurement

The 230 Series analyzes gas composition by continuously comparing the sample gas with a reference gas of known thermal conductivity. This comparison is performed in a two-chamber detector cell block. Reference gas occupies one chamber, and this gas can be flowing or non-flowing (sealed chamber) depending on the application. Sample gas flows through the other chamber.

A pair of temperature-sensitive heated filaments is mounted in each chamber. These filaments are part of a Wheatstone Bridge circuit. Should the sample gas composition change, its thermal conductivity will also change. This means it will conduct a different amount of heat away from the sample gas filaments. Since the resistance of the filaments is a function of their temperature, their resistance changes when the sample gas composition changes.

Any such change creates an imbalance in the Wheatstone Bridge, resulting in an electrical signal proportional to the change. Since the temperature of the filaments in the reference chamber are precisely maintained by a proportional controller, the 230 Series provides an accurate measure of any change in sample gas composition.

In certain applications, the thermal conductivity characteristics of the sample gas may exhibit a degree of non-linearity. For these applications an optional linearizer circuit is available that automatically linearizes the analyzer's signal output and meter readout.

Custom Products for Special Applications

In addition to standard features and options, Teledyne also provides custom-engineered analyzers and complete monitoring systems to satisfy unique application requirements. For example, Teledyne manufactures a special triple-range unit for monitoring the concentration of hydrogen, carbon dioxide, and air in hydrogen-cooled turbine generators. Also, systems incorporating several analyzers with customized signal conditions can be provided.

Applications

- Air liquefaction plants – monitoring purity of argon, oxygen, hydrogen, nitrogen, helium, carbon dioxide, and neon.
- Ammonia plants – determining hydrogen in nitrogen, ammonia, argon; ammonia in hydrogen; ammonia in air
- Power generating plants – hydrogen cooling gas in turbine generator housings during maintenance purging; carbon dioxide in turbine generator housing during maintenance purging; detecting hydrogen scavenged from generator and seals; checking hydrogen purity
- Chemical plants – contamination control; hydrogen purity; monitoring purging operations
- Petroleum refineries – measuring hydrogen purity in gaseous hydrocarbons (recycle gas)
- Gas proportioning control – proportion of nitrogen to hydrogen, nitrogen to argon, and other mixtures
- Heat treating – measurement of hydrogen in nitrogen and other contaminants in blanketing gases
- Refrigeration and storage – detection of ammonia, freon or carbon dioxide in air
- Monitoring hydrogen: As purity decreases, operating costs increase when hydrogen is used as a cooling medium in high-capacity turbine generators. Even small decreases in purity can escalate costs. Teledyne's 230 Series is ideally suited for continuously monitoring hydrogen to ensure optimum purity levels and maximum operational efficiency. And because hydrogen can be explosive when mixed with oxygen, the 230 Series acts as a guard over personnel safety.

Available Configurations

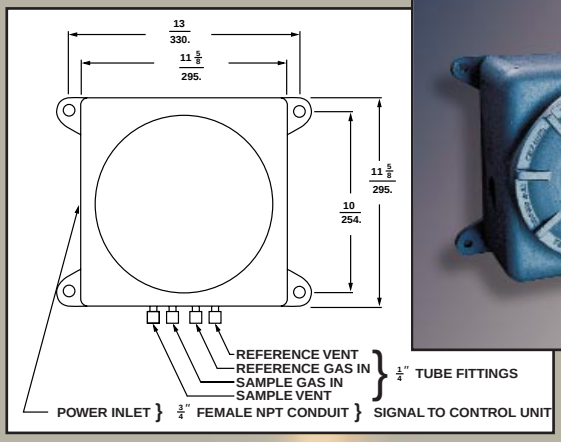
To satisfy a variety of application requirements, several standard configurations are available with the 230 Series.

MODEL 235	MODEL 238
This version is completely contained in a welded sheet metal enclosure suitable for panel mounting in general purpose (non-hazardous) areas.	The bulkhead mount analyzer is completely contained in an explosion-proof housing for Class I, Division 1, Groups C, & D hazardous areas. Optional housing is available for operation in Group B rated hazardous areas.

MODEL 237

This split architecture unit is composed of an Analysis Unit, which contains the thermal conductivity detector and associated temperature control hardware, and a Control Unit, which includes calibration controls, meter readout, output and alarm functions, fuse, and range selector switch. The Analysis Unit is contained in an explosion-proof housing for Class I, Division 1, Groups B, C, & D hazardous areas.

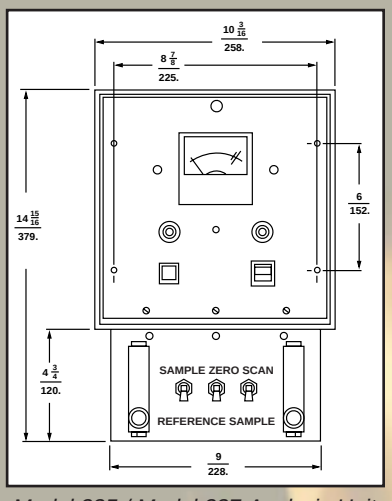
Measurements are given in inches and millimeters.



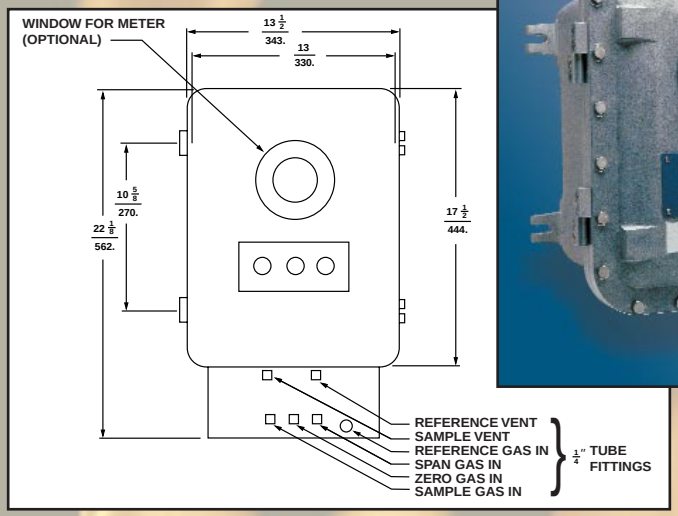
Model 237 Control Unit

MODEL 237

MODEL 235



Model 235 / Model 237 Analysis Unit shown with optional gas panel. 13" (329 mm) deep



Model 238 with optional gas control panel

MODEL 238

Options

- Isolated/non-isolated signal output: Current (1-5, 4-20, or 10-50 mAdc); Voltage (0-1, 1-5, or 0-10 Vdc)
- Integral gas control panel
- Alarm setpoints and relay contacts
- Meter readout
- Dual range
- Triple range
- Linearizer (for certain applications)
- Sealed reference cell (for certain applications)
- Special analyzer version for turbine generator applications

Features

Standard 0-1 Vdc signal output; mVdc and mAdc outputs available

Optional digital linearizer circuit is available for those applications that exhibit non-linear thermal conductivity characteristics

Up to three switch-selectable ranges can be provided

Proportional (electronic) temperature control of heated thermal conductivity cell box optimizes accuracy and stability

Proven four filament thermal conductivity detector cell made of rugged, nickel-plated brass construction (stainless steel available), providing years of trouble-free service

Alarm(s) and signal output terminal strip connectors require no soldering or wiring lugs

Easy servicing: hinged front panel provides excellent access to modular plug-in electronics and thermal conductivity detector

Minimal maintenance: a simple calibration check is the only required maintenance

Specifications

Range
Application dependent. Single and dual ranges available for most applications. Triple range available (may require optional linearizer.)

Accuracy
±1% of full scale for most binary mixtures (application dependent)

Resolution
Changes of ¼ to ½ percent of full scale detected reliably

Response
90% in less than 50 seconds (depending on the sample flow rate)

Stability
Zero drift less than 1% of scale in 24 hours (most applications)

Ambient temperature
32° to 125° F (0° to 52° C)

Signal output
0-1 Vdc (standard); mVdc output available at no charge

Sample requirements
40 – 200 cc/minute

Power requirements
115 VAC, 50/60 Hz, 115 watts (typical); 220 Vac versions available

Mounting:
Panel or bulkhead mounting available

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Warranty

Instrument is warranted for 1 year against defects in material or workmanship

NOTE: Specifications and features will vary with application. The above are established and validated during design, but are not to be construed as test criteria for every product. All specifications and features are subject to change without notice.

CERTIFIED
ISO 9001

Accredited by the Council for Accreditation (RvA)

National Accreditation Program